JOHN F. KENNEDY
SPACE CENTER

APOLLO/SATURN IB
FLIGHT SAFETY PLAN

VEHICLE AS-201

K-IB-02.13

APOLLO/SATURN IB
FLIGHT SAFETY PLAN

VEHICLE AS-201

JANUARY 17, 1966

APPROVED:

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K-IB-02.13/3

APOLLO/SATURN IB
FLIGHT SAFETY PLAN

VEHICLE AS-203

CHANGE 1

June 21, 1966

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SECTION I
INTRODUCTION

1.1 PURPOSE

This Flight Safety Plan presents flight safety requirements, restrictions, and instrumentation necessary for each launch. The plan defines flight safety responsibilities of the Air Force Eastern Test Range (AFETR) and Kennedy Space Center (KSC). The requirements for flight termination and propellant dispersion are described, and the restrictions and instrumentation applicable for each Apollo/Saturn IB flight are listed.

1.2 AUTHORITY

The Flight Safety Plan is authorized within KSC by the Apollo Test Requirements Document, M-D MA 1400, dated May 20, 1964.

1.3 SCOPE

This plan is applicable during the launch countdown and throughout powered flight of the vehicle.

SECTION II
FLIGHT SAFETY RESPONSIBILITIES

2.1 AIR FORCE EASTERN TEST RANGE

The Webb-McNamara agreement of January 17, 1963, supplemented by the AFMTC/LOC agreements of June 5, 1963, places the responsibility for flight safety of all launches from the AFETR on the Commander of the AFETR. This responsibility includes specifying flight termination system requirements, protecting life and property from an errant vehicle (except within KSC), establishing data requirements, impact limit lines, flight safety instrumentation requirements, etc.

2.2 KENNEDY SPACE CENTER

By the same agreements cited in paragraph 2.1, the Director, KSC, is responsible for the protection of life and property within KSC from an errant vehicle launched or intended to be launched from the area. This responsibility includes designating launch danger areas, clearing these areas during danger periods, etc. Also included is the responsibility for Crew Safety on manned launches from KSC. The responsibility of the Director ends when the vehicle lifts off the pad. Flight safety then becomes the sole responsibility of the Commander of the AFETR.

SECTION III
FLIGHT SAFETY REQUIREMENTS

All ballistic or space booster vehicles launched at the AFETR must contain two independent flight termination systems which are compatible with the AFETR ground system. The two systems must be installed on the last powered stage and must be capable of destroying all powered stages of the vehicles. For stages that go into orbit prior to ignition, a command system is not required. However, the stage must be capable of being destroyed by command from the preceding stage and also must contain an automatic flight termination system. All stages that do not contain a command system must contain an automatic flight termination system. The automatic flight termination system destroys the thrust capability of the stage in the event of premature separation or break-off from the other stages carrying a flight termination system. The termination system is automatically activated by mechanical means when premature separation or break-off occurs. The manned portion of a space vehicle will not require a destruct system on manned flights. Propulsive systems that are not considered as a stage of a vehicle (retro-rockets, escape rockets, payloads, etc.) and which present radiological, toxicological, or explosive hazards will require an automatic flight termination system if they have the capability of violating the launch area or flight safety lines. For liquid-propelled vehicles, flight termination action must cause engine shutdown and fuel dispersion or intermixing, depending upon the nature of the propellants.

The Apollo/Saturn IB carries two independent flight termination and propellant dispersion systems in each active booster stage. There is no destruct system associated with the Apollo spacecraft. Figures 3-1 and 3-2 pictorially display the IB flight termination propellant dispersion system.

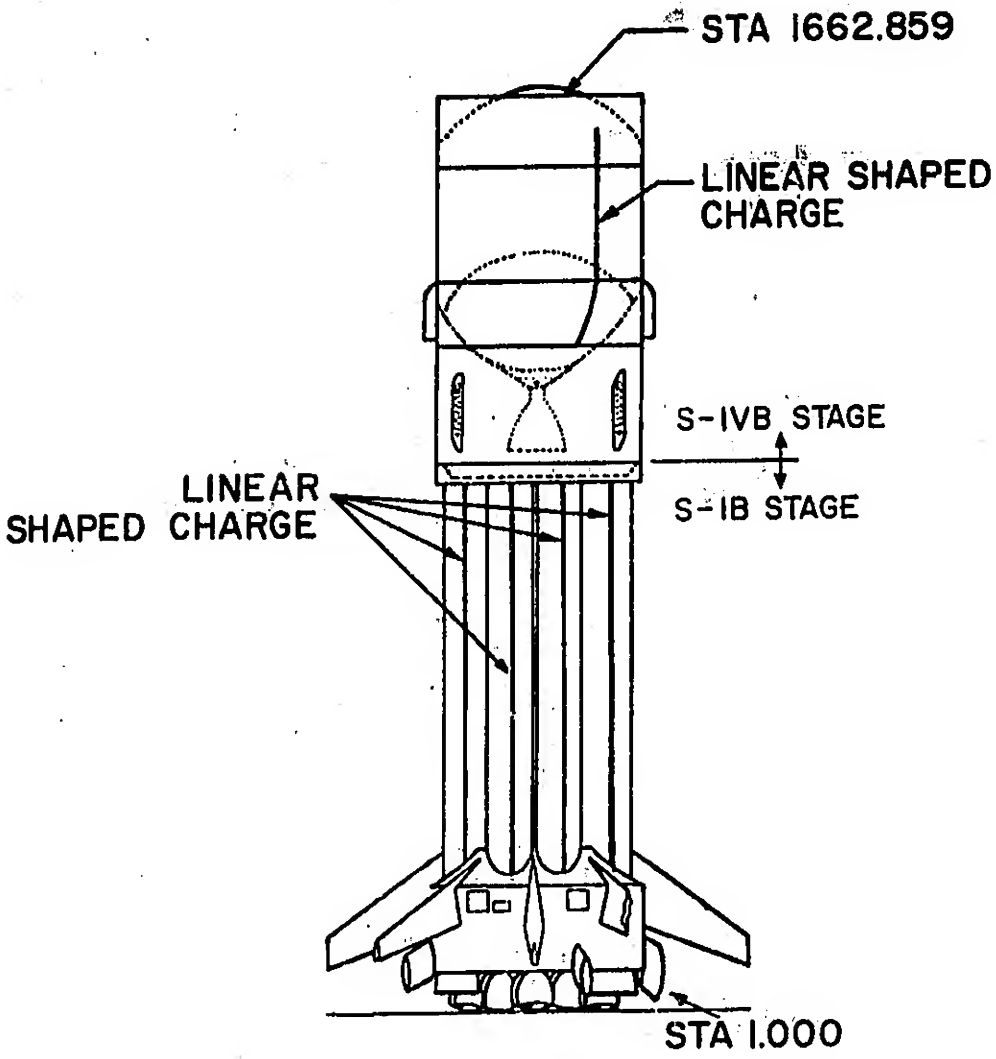

Figure 3-1. Propellant Dispersion Ordnance - Shaped Charge Locations

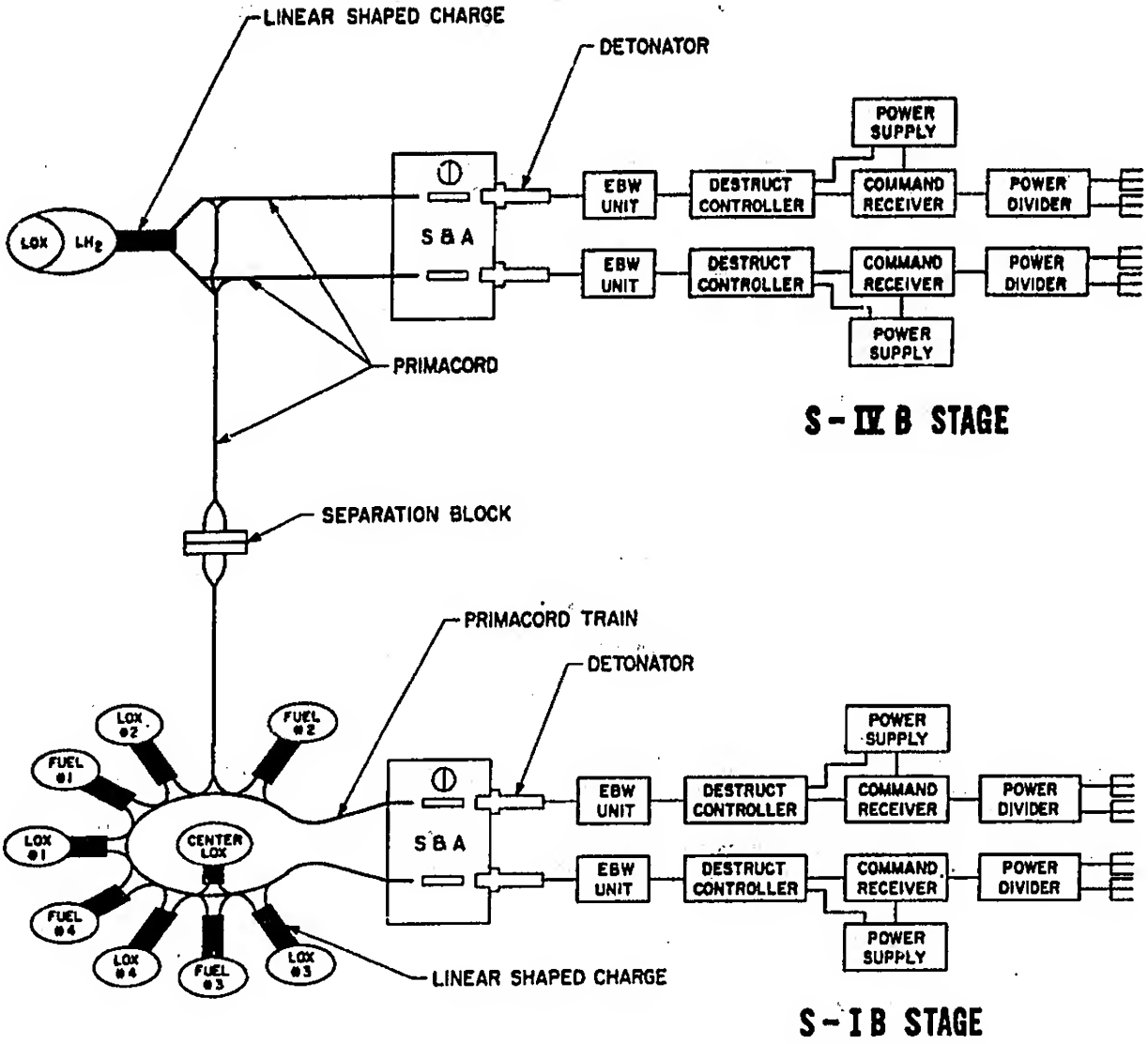

Figure 3-2. Propellant Dispersion System Block Diagram

SECTION IV
FLIGHT SAFETY RESTRICTIONS

4.1 WEATHER MINIMUMS

4.1.1 CEILING. A minimum ceiling height is imposed on all launches. The height of the ceiling is determined by the time required for the launch area radars to acquire the vehicle after liftoff. If the Cape FPS-16 radar and the KSC TPQ-18 radar are committed for "beam intercept" at 14 seconds and 20 seconds after liftoff, respectively, the minimum ceiling for AS-203 will be zero. "Beam intercept" requires the two radars to be looking at the point in space where the vehicle will be at 14 and 20 seconds (14 seconds for the FPS-16 and 20 seconds for the TPQ-18). The radars acquire and lock-on to the vehicle as it passes through these areas. If the radars are not operational or precipitation between the radar sites and the pads makes "beam intercept" impossible at launch, the minimum ceiling for AS-203 will be 850 feet.

4.1.2 VISIBILITY. A minimum visibility limit is imposed on all launches. The visibility limit is usually determined by the vertical wire skyscreen site selected for the launch. If the "beam intercept" method of radar acquisition is used for AS-203, the visibility limit will be zero. Otherwise, vertical wire skyscreen 1.9, which is approximately two miles from Launch Complex 37, will be used.

4.1.3 WINDS. A wind restriction is usually imposed on the launch if the vehicle remains over Cape Kennedy for any length of time. This restriction prevents pieces of a destructed vehicle from drifting into protected areas. The wind restriction for Apollo/Saturn 203 is a 1.25 σ annual wind profile blowing from 65 degrees east of north (Figure 4-1) and applicable to an altitude of 30 kilometers. In the event this profile is violated by prevailing wind conditions during countdown, the range safety division performs a computer-simulated flight, terminating thrust and breaking the vehicle into pieces at each interval, with the prevailing winds acting on them to determine if the pieces can fall outside the impact limit lines.

4.2 OPERATIONAL RESTRICTIONS

4.2.1 LAUNCH VEHICLE. NONE

4.2.2 SPACECRAFT. Not applicable for Vehicle AS-203.

4.2.3 CREW SAFETY. Not applicable for Vehicle AS-203.

4.2.4 OTHER CONSIDERATIONS. Other agreements and/or restrictions that have a bearing on the overall flight safety picture have been reached mutually.

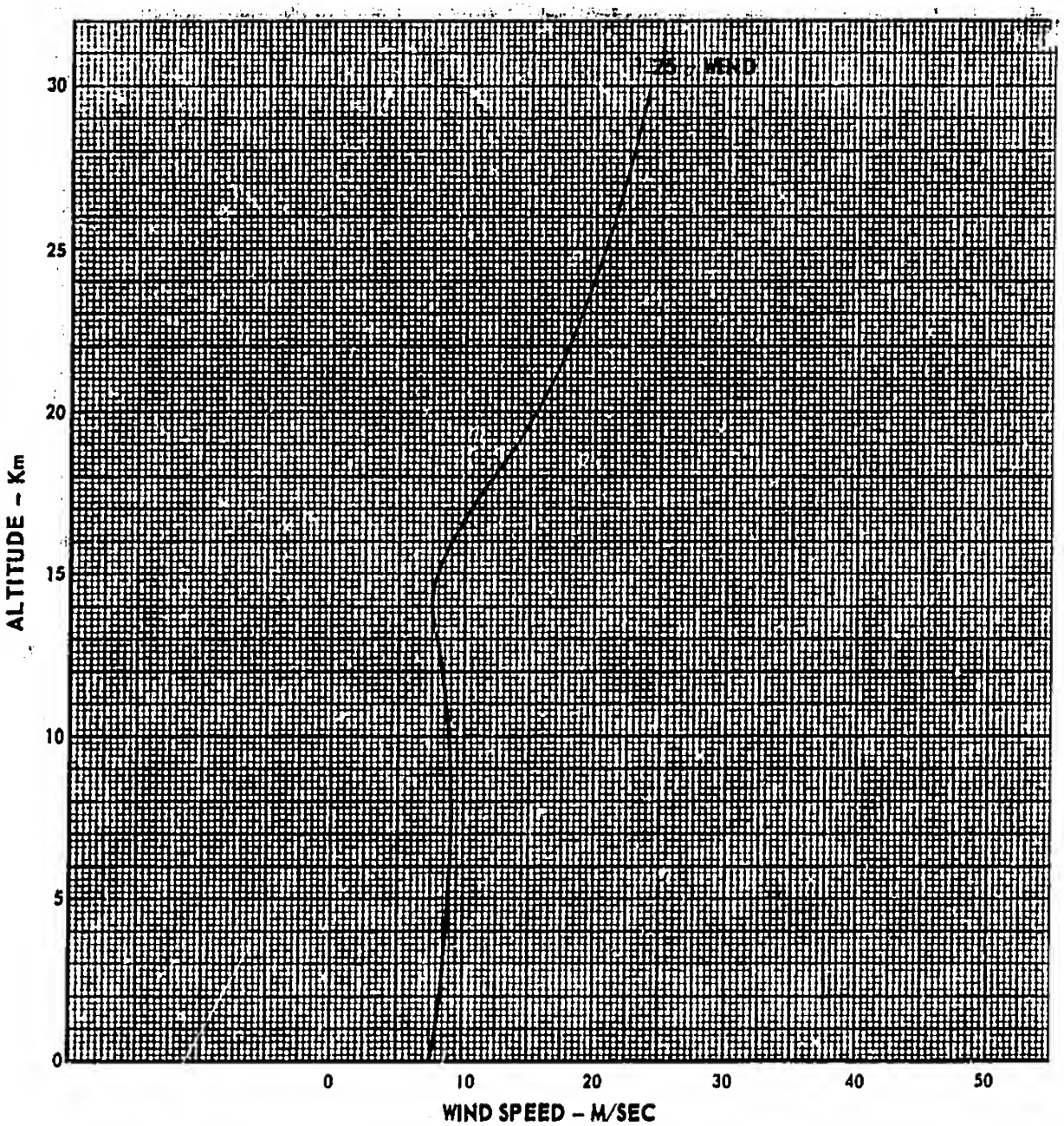

Figure 4-1. 1.25 σ Annual Wind Profile from 65-Degree Azimuth

A time delay will be imposed between the commands "cutoff" and "destruct." This interval is governed by a timer on the Range Safety Officer's (RSO) console. The timer for Vehicle AS-203 has been set for two seconds.

When the S-IVB has achieved orbital conditions and cutoff has occurred, the safing command will be sent as soon as the RSO is satisfied that the command destruct system is no longer needed. The safing command will remove power from the command receivers and, in case the firing capacitors have been charged, will discharge the capacitors to ground.

The Digital Command transmitter at Bermuda (station 67) will be MANDATORY for launch.

SECTION V
FLIGHT SAFETY INSTRUMENTATION

The AFETR requires that at least two different, adequate sources of safety data for each phase of powered flight be operational at launch. An "adequate" source is defined as one which can protect the applicable impact limit line without endangering a normal missile. The RSO will ensure that the adequate data source requirement is met and that those requirements designated "critical" are provided before giving a launch clearance. Those items designated "critical" for AS-201 are:

1. Forward Observer
2. Impact Predictor

Instrumentation available during S-IB stage powered flight are:

1. High Resolution Trackers (HRT) 1 & 2
2. KSC TPQ 18 C-Band Radar (19.18)
3. Patrick AFB TPQ 18 C-Band Radar (0.18)
4. Glotrack Station I
5. Program and Flightline ELSSE
6. Impact Predictor
7. Cape FPS 16 C-Band Radar (1.16)

Instrumentation available during S-IVB stage powered flight are:

1. KSC TPQ 18 C-Band Radar (19.18)
2. Patrick AFB TPQ 18 C-Band Radar (0.18)
3. GBI FPS-16 C-Band Radar (3.16)
4. Grand Turk TPQ 18 C-Band Radar (7.18)
5. Antigua TPQ 18 C-Band Radar (91.18)
6. Flightline ELSSE
7. Impact Predictor

APPENDIX A
DOCUMENT CATEGORIES

APOLLO/SATURN IB
FLIGHT SAFETY PLAN
VEHICLE AS-201

Category	Brief Description of Related Contents	Emphasis Pri.	Emphasis Sec.	See Page (s)
11. Safety	Plan presents flight safety requirements, restrictions, and instrumentation necessary for each Apollo/Saturn IB launch.	X		1-1